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WEATHER AND CIRCULATION OF NOVEMBER 1971

Cool in the Northeast in Association With the Development of an East Coast Trough

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1. HIGHLIGHTS

One of the major features of the mean 700-mb circulation for November 1971 was the strong omega-type blocking pattern that was observed over the Atlantic Ocean. While the High maintained its influence over oceanic areas, the deep trough to its east brought early winter storminess to parts of Europe, particularly Scandanavia. The trough upstream of the block was associated with lower than normal surface temperatures over parts of the eastern United States, especially in the northeast where temperatures had been well above normal during September and October.

2. MEAN CIRCULATION

The mean 700-mb ridge over central Asia remained nearly stationary during November 1971, but strengthened somewhat, as did the northwesterly flow to its east (figs. 1–3). The resulting advection of cold air to the coast was accompanied by the development of a mean Low in the Sea of Okhotsk. Meanwhile, the midlatitude trough that had been located over the Sea of Japan during October (Dickson 1971) moved eastward into the Pacific.

Downstream in the Pacific, the northern portion of the midlatitude wave train moved eastward in response to the development of the Sea of Okhotsk Low. The mean ridge

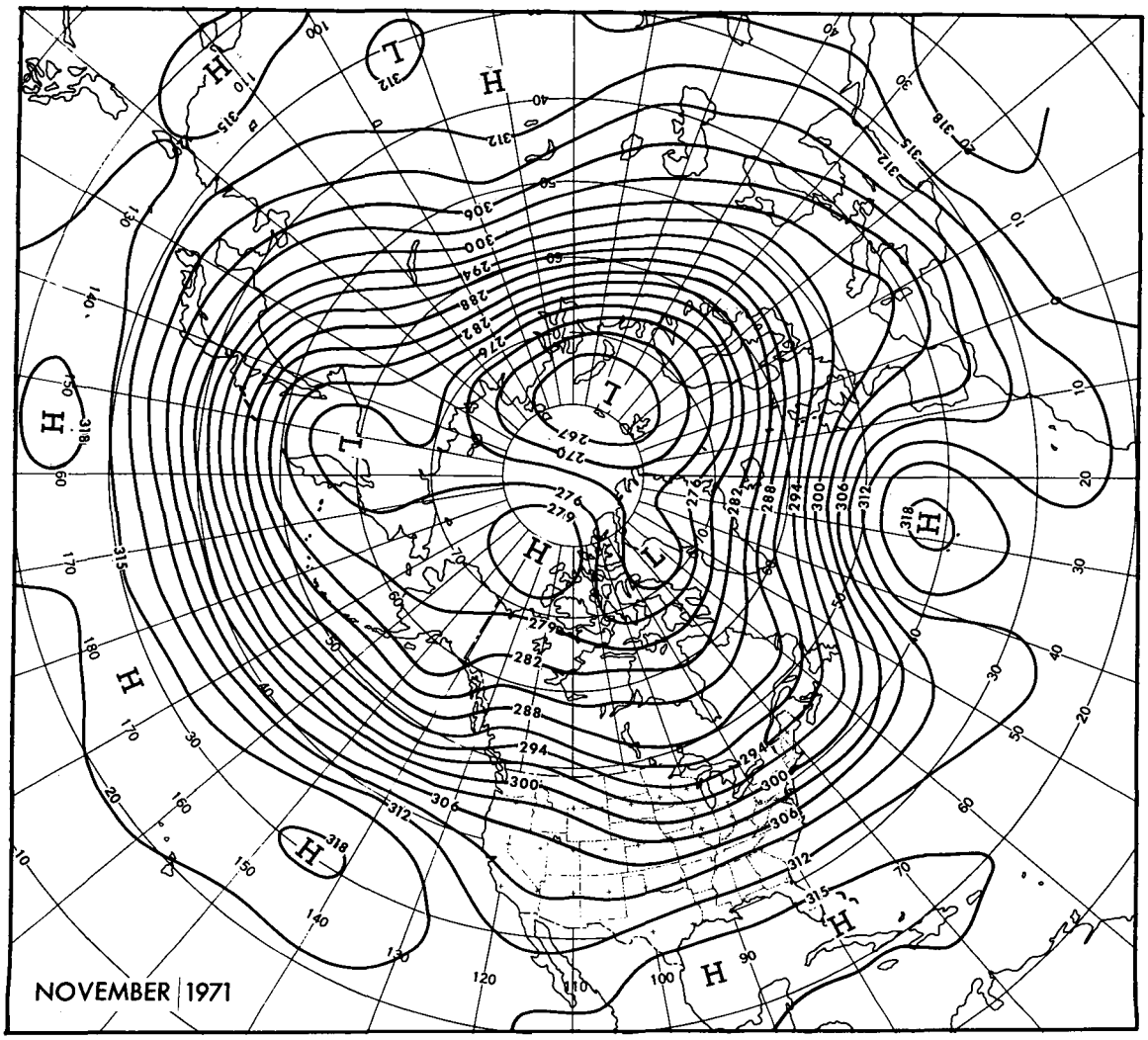


FIGURE 1.—Mean 700-mb contours in dekameters (dam) for November 1971.

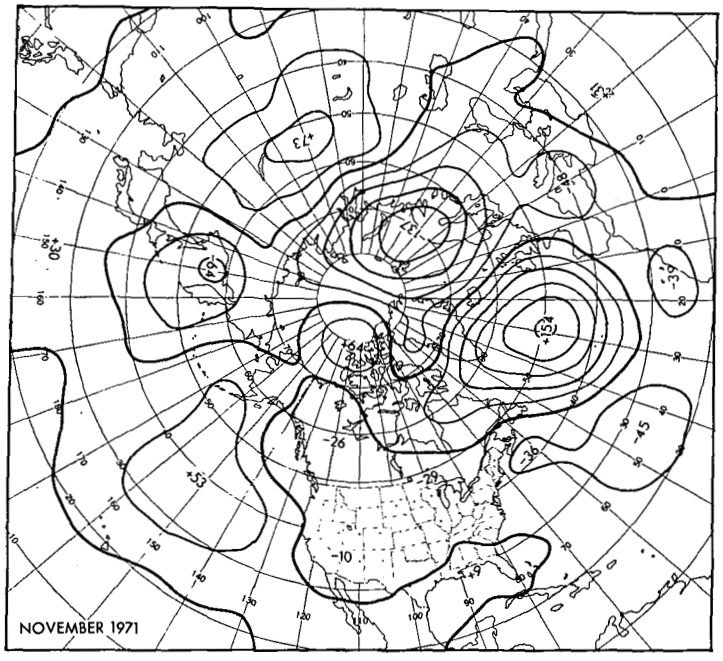


FIGURE 2.—Departure from normal of mean 700-mb height (m) for November 1971.

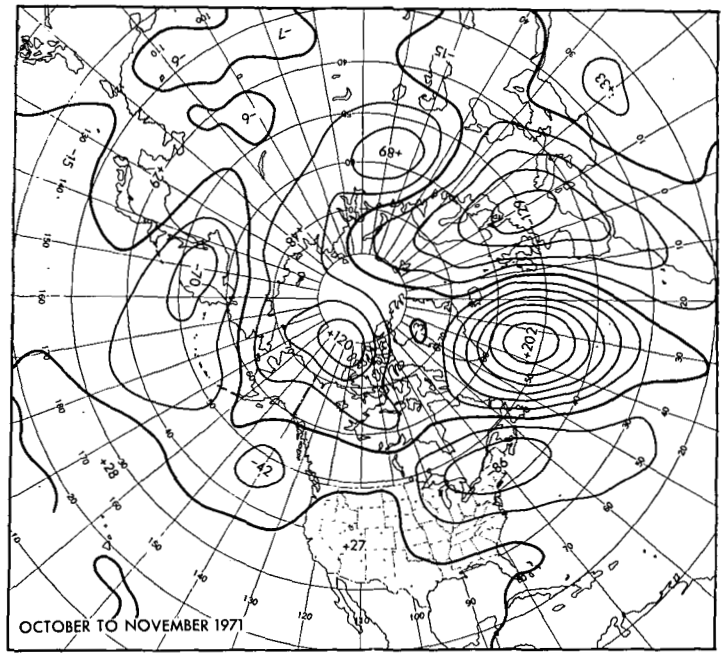


FIGURE 3.—Mean 700-mb height anomaly change (m) from October to November 1971.

that had been in the Bering Sea during October progressed to the Alaskan Peninsula replacing a trough that moved into the Gulf of Alaska. The southern portion of the wave train, however, remained nearly stationary as stronger than normal subtropical Highs were observed over both the eastern and western parts of the ocean.

The circulation over western North America in November was very similar to that of October with a weak ridge extending northward from Oregon and a weakening trough over the southwestern United States. Anomalous heights rose by 120 m in the Arctic Basin, however, as a blocking High replaced the cyclonic conditions of October.

Over eastern Canada, a trough extended southward from a Low over Baffin Bay. The southern extension of this trough into the United States was evident from the western Great Lakes to Texas.

During this month, heights fell markedly in the western Atlantic as short waves, traversing the East Coast, deepened strongly over the warm oceanic water. The resulting mean circulation over the eastern half of the Nation was in sharp contrast to the strong ridge that had persisted during the previous 2 mo. Mean height departures fell more than 80 m over the Northeast from October to November, and heights averaged below normal there as well as over most of the country. Only in the Gulf Coast States did positive height anomalies prevail.

The aforementioned block over the central Atlantic was the strongest feature of the November circulation. Positive departures exceeded 150 m for the month, a rise of more than 200 m from October. This ridge was associated with both the retrogression of the strong October European

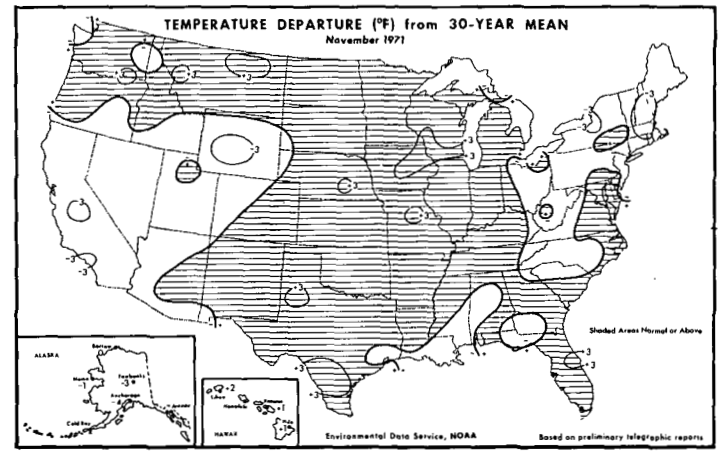


FIGURE 4.—Departure from normal of average surface temperature (°F) for November 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

ridge and the tendency for cyclogenesis along the East Coast of North America. Downstream, large height falls were observed over much of Europe and North Africa as a deep trough replaced the October ridge. Heights were almost 140 m below normal near Scandanavia with a weaker negative center over the Mediterranean Sea.

3. MONTHLY TEMPERATURE

Mean temperatures in the United States during November were above normal over much of the country (fig. 4) as the developing Gulf of Alaska trough limited intrusions of cold Arctic air into the Nation. Lower than normal

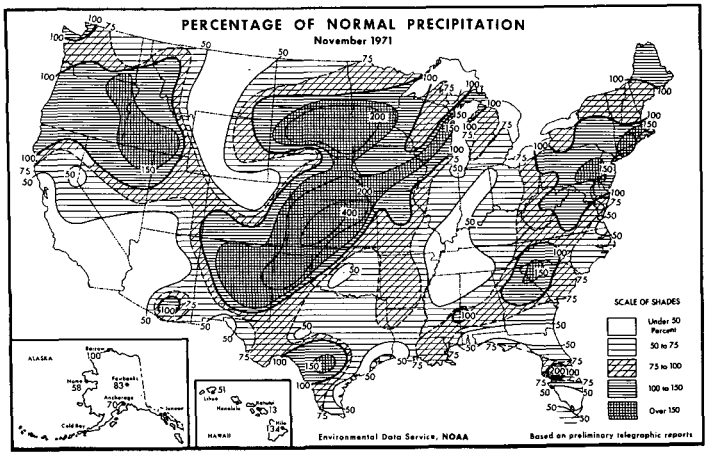


FIGURE 5.—Percentage of normal precipitation for November 1971 (from Environmental Data Service and Statistical Reporting Service 1971).

temperatures did occur in much of the East from New England to the Carolinas, however, in conjunction with the deep trough in the western Atlantic, as well as in the Southwest as the east Pacific ridge remained strong at middle and low latitudes. This anomaly pattern was a distinct change from the warm in the east and cold in the west regime that had persisted since September.

This was the coldest November since 1904 at Concord N.H., where the mean temperature was 32.4°F, more than 5°F below normal. Most departures across the Nation, however, were within 1°–2°F of normal as oscillations of the weekly temperature patterns tended to cancel out.

4. MONTHLY PRECIPITATION

Heaviest precipitation with respect to normal fell in the area from New Mexico to the Dakotas and Minnesota (fig. 5) in the vicinity of the storm path associated with the maximum cyclonic curvature at 700 mb. Parts of Kansas received more than four times the normal November precipitation. Concordia reported 4.88 in. of precipitation for a new November record, and Dodge City had 3.75 in. for the heaviest November total there since 1909. Precipitation was also heavier than normal over part of the Northwest in connection with the cyclonic deepening in the Gulf of Alaska. Although not indicated on the preliminary analysis, West Palm Beach, Fla. received a record November rainfall of 10.77 in., 7.91 in. above normal.

Heavy snowfall associated with a storm late in the month contributed to above-normal precipitation in parts of the East. November snowfall records were established at Worcester, Mass., and Albany, N.Y. with totals of 20.7 and 24.0 in., respectively.

Less than half the usual November precipitation occurred in a portion of the northern Rocky Mountains under the mean northwesterly flow at 700 mb. Drier than normal weather also occurred southwestward from the Great Lakes, to the east of the prevailing storm track, and in the far Southwest.

5. WEEKLY WEATHER

November 1–7

The combination of a strong ridge over Alaska and a Low over southern Canada (fig. 6A) helped bring cold Arctic air into the Nation during the first week of November (fig. 6B). Although temperatures averaged above normal over part of the East due to early-week warmth (of record intensity at some stations), record low daily minima occurred in wide areas of the country by the end of the week. A persistent snow cover in Wyoming helped to keep temperatures there 12°–15° F below normal during the week.

Except for some heavy precipitation in Washington, weekly precipitation was generally light west of the Great Plains States (fig. 6C). Much of the area had no measurable precipitation during the week as mean northwesterly flow aloft covered the region.

Weekly precipitation was somewhat heavier east of the Great Plains States. Amounts in excess of 2 in. occurred near the mean trough from Kansas to the Great Lakes. The heaviest precipitation this week was at West Palm Beach, Fla., where more than 9 in. of rain was reported, already establishing a new record for the month.

November 8–14

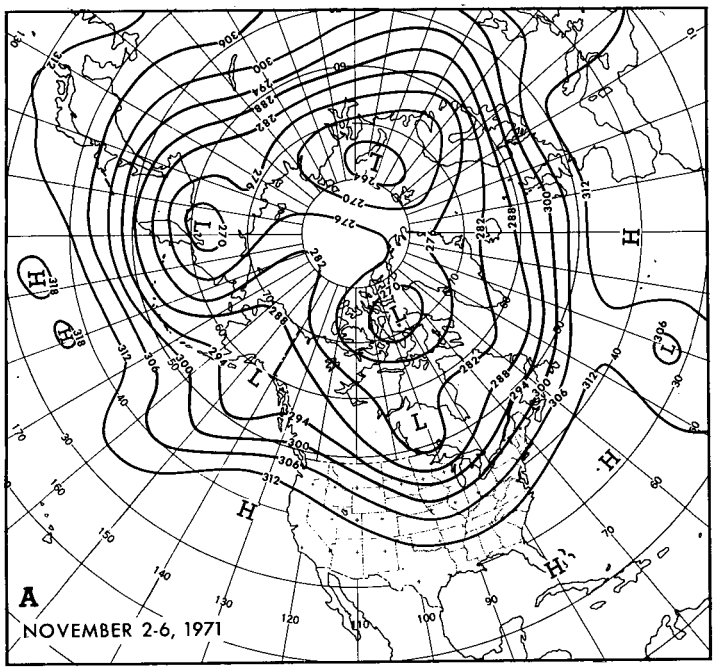
Elements of the mean 700-mb midlatitude wave train from the central Pacific to the Atlantic moved eastward this period in response to the deepening of the trough south of Kamchatka (fig. 7A). Over the United States, a strong ridge was present to the lee of the Rocky Mountains, replacing the cyclonic conditions of the previous week.

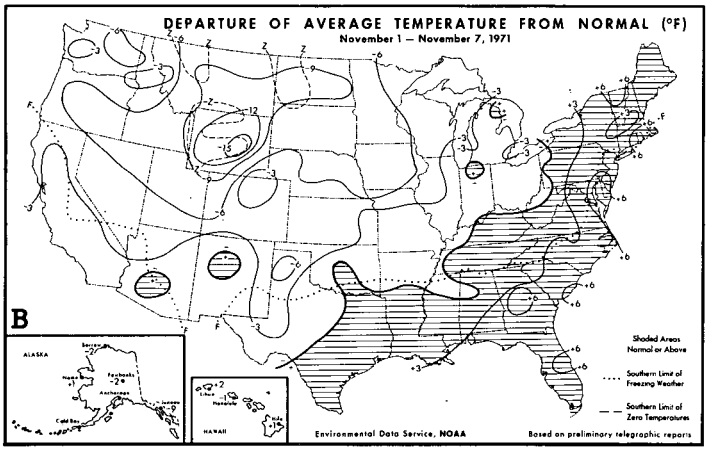
Downstream, from North America to Asia, the circulation was similar in phase to the monthly mean as a blocking High was established over the Atlantic with a trough along the East Coast of North America. Strong deepening occurred east of the High as a Low developed over southern Europe.

In conjunction with the sharp change in the mean circulation, average temperatures in the United States reversed from those of the first week. Higher than normal temperatures dominated most areas of the nation (fig. 7B) with the greatest departures under the axis of the mean ridge. In contrast to the record cold at the beginning of the week, some record daily maxima were recorded in the Central States on the 14th.

Lower than normal temperatures prevailed over the eastern quarter of the Nation, to the rear of the mean trough, as well as in California.

This was a dry week across most of the Nation (fig. 7C). Significant precipitation totals were limited to the West Coast States where more than 2 in. of rain fell in





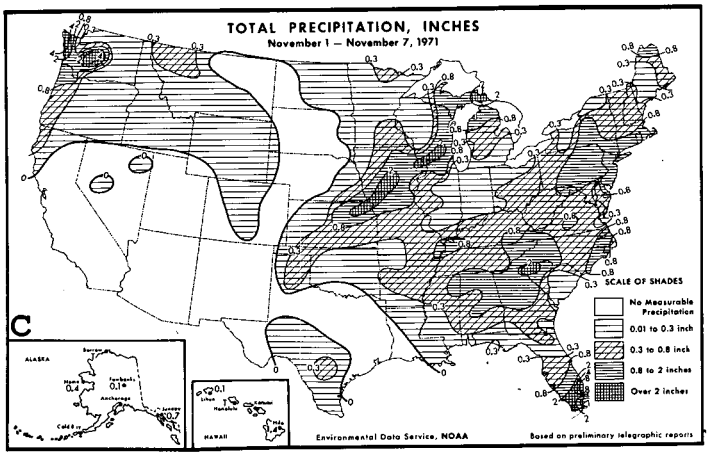
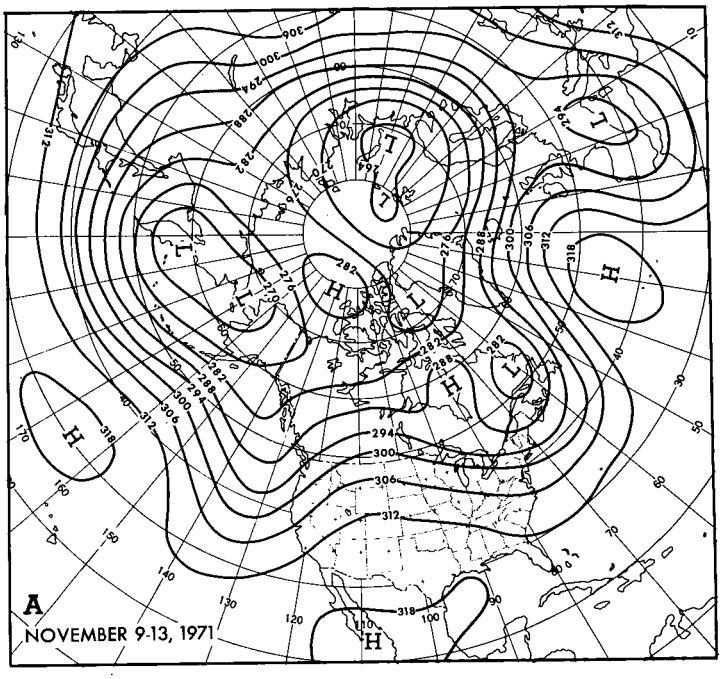
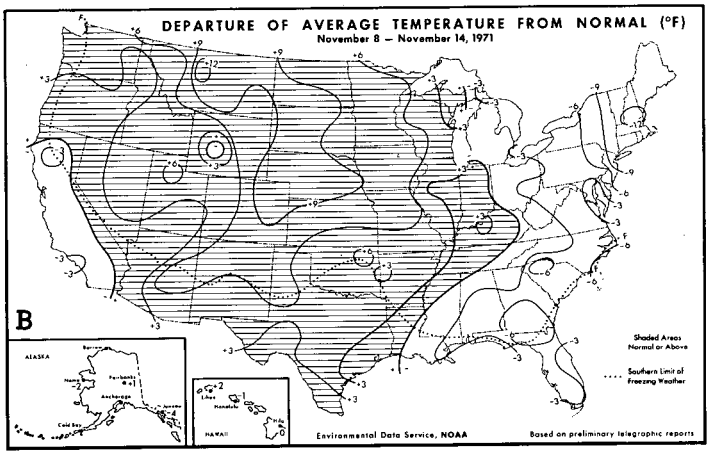


FIGURE 6.—(A) mean 700-mb contours (dam) for Nov. 2–6, 1971; (B) departure of average surface temperature from normal (°F) and (C) total precipitation (in.) for week of Nov. 1–7, 1971 (from Environmental Data Service and Statistical Reporting Service 1971).





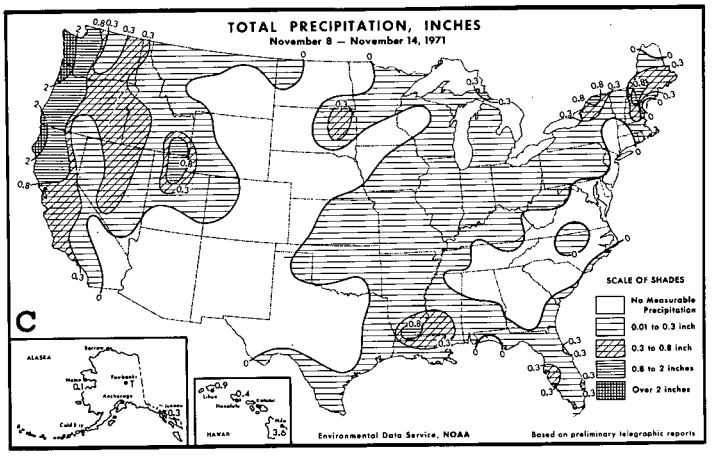


FIGURE 7.—Same as figure 6, (A) for Nov. 9–13, 1971; (B) and (C) for week of Nov. 8–14, 1971.

response to the proximity of the mean trough off the coast.

November 15–21

The mean 700-mb circulation for November 16–20 (fig. 8A) shows continued eastward motion of most midlatitude features located from the Pacific across North America. The strong Atlantic High remained stationary, however, and wavelengths upstream became quite short. Over North America, one ridge occurred along the West Coast, a trough extended southwestward from Hudson Bay, another ridge maintained itself along the East Coast, while a sharp trough remained south of Newfoundland.

The mean 700-mb ridge over the eastern United States was particularly persistant this week. Low-level stability associated with the ridge caused an air pollution problem for the Birmingham, Ala. area. On the 17th, industrial firms there were requested to cut back production in an effort to reduce stack emissions. Increasing surface winds ahead of a cold front solved the problem the next day, however.

Mean surface temperatures in the United States during the week were above normal over much of the Nation with some below normal in New England and the Southwest (fig. 8B). Temperatures were quite high in the middle Mississippi and Ohio Valley regions where they averaged more than 9°F warmer than normal. By the end of the week, however, cold Canadian air was moving across the eastern half of the country.

Although most of the Nation had some precipitation this week (fig. 8C), heavier amounts were limited to the central part of the country. More than 2 in. of precipitation fell from the Texas Panhandle to Minnesota, to the east of the mean trough, and from southeastern Texas to Louisiana. Most of the heavier precipitation was associated with a slowly moving cold front about the middle of the week.

November 22–28

The mean 700-mb circulation for November 23–27 (fig. 9A) shows a pronounced deamplification of the midlatitude wave pattern over most of the Northern Hemisphere. Cyclonic flow enveloped much of the Pacific as a broad trough was located about midocean and a mean Low moved into the Gulf of Alaska. A High was located over western Alaska and, while a portion of the ridge of the previous week remained over the southeastern Pacific, the northern part moved inland over North America.

Over North America, the mean flow was weak. In Canada, a blocking pattern emerged with a Low near Lake Winnipeg and a High to the north. In the United States, one trough extended southward from the Low in Canada and another remained along the East Coast, with a weak ridge in between. The Atlantic High weakened to the north as the northern European Low retrograded.

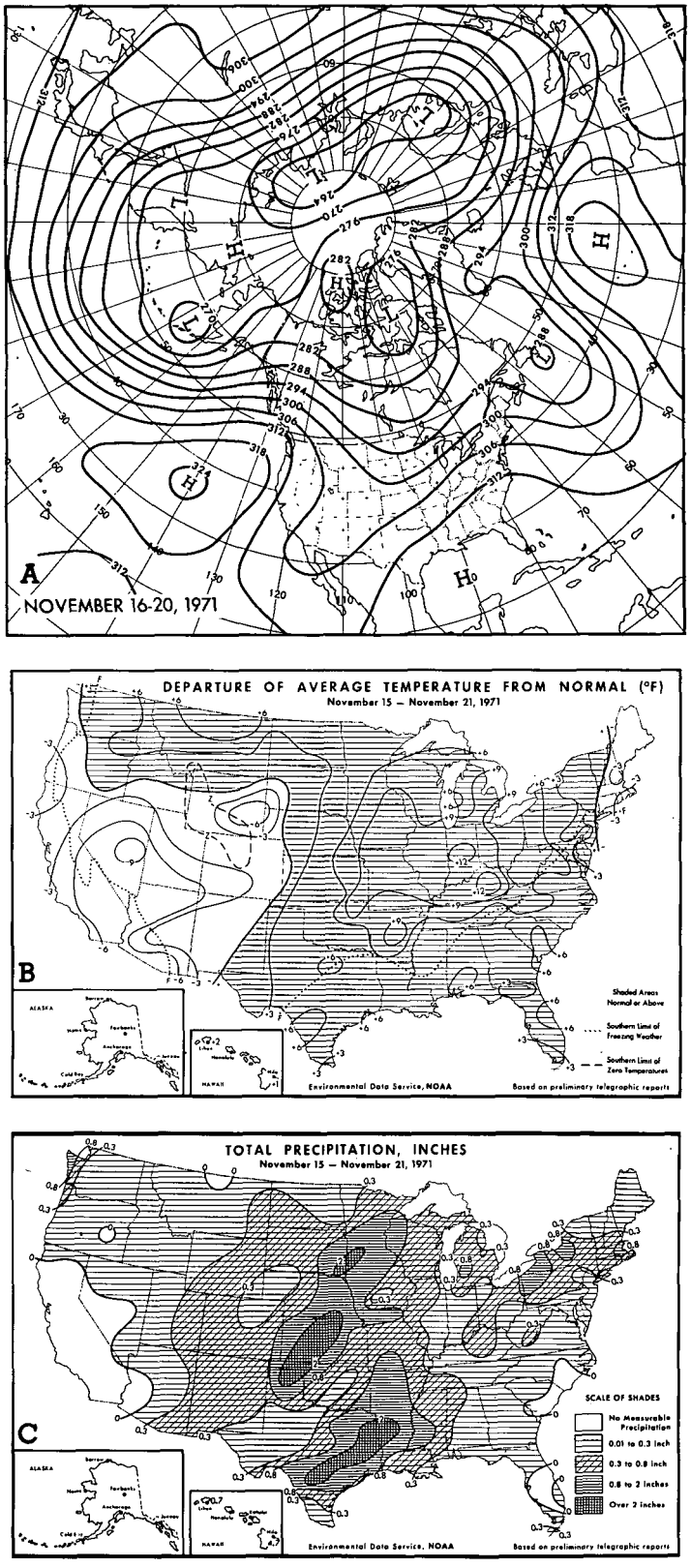
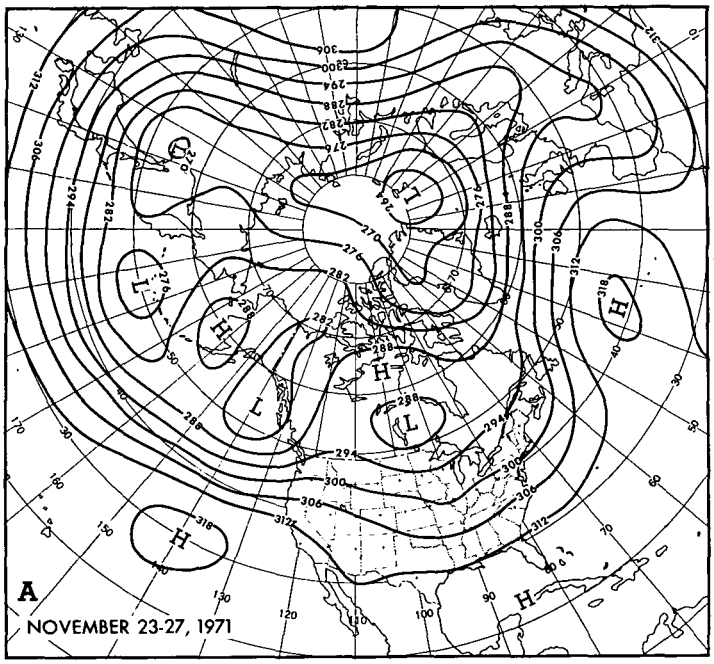
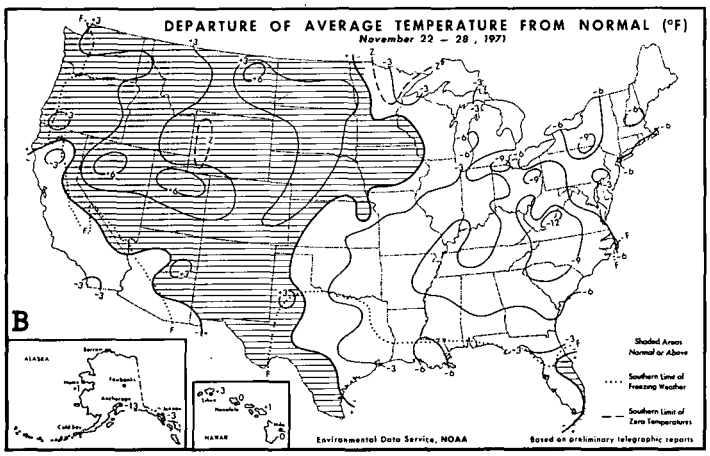


FIGURE 8.—Same as figure 6, (A) for Nov. 16–20, 1971; (B) and (C) for week of Nov. 15–21, 1971.

Temperatures in the United States averaged below normal in the East and above normal in the West, although some cooler than normal air remained in the far Southwest (fig. 9B).





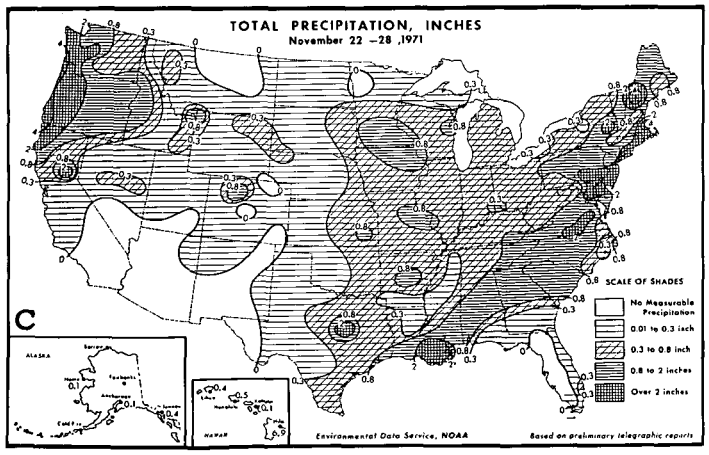


FIGURE 9.—Same as figure 6, (A) for Nov. 23–27, 1971; (B) and (C) for week of Nov. 22–28, 1971.

Precipitation was heaviest along coastal areas of the Nation this week (fig. 9C). In the Pacific Northwest, more than 4 in. of rain fell along the coast. Likewise, more than 4 in. of precipitation occurred in parts of New England, with 2 in. or more northward from North Carolina. Most of this precipitation was associated with an early-season winter storm that moved up the coast on the 24th and 25th. The storm spread rain along the immediate coast, but heavy snow fell inland at higher elevations. Snowfall accumulations from 10 in. to more than 20 in. from Virginia to Maine impeded travel during the Thanksgiving holiday.

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